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# Use of choreotherapy in the process of function improvements in older adults. A systematic review

## Zastosowanie choreoterapii w procesie usprawniania osób starszych. Przegląd systematyczny

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**Key words**
choreotherapy, dance, dance therapy, older adults

**Abstract**
Introduction: Choreotherapy uses movement and dance to express feelings, emotions and experiences. It provides an opportunity to train in balancing, coordination, and fluency and synchronisation of movement. Taking into account the different types of disorders that are typical of old age, the beneficial qualities of choreotherapy seem to perfectly coincide with the requirements of the comprehensive rehabilitation of older adults.
Objective: To review the literature on the use of choreotherapy in a population of older adults, in order to give recommendations for using this method, or for rejecting it.
Methods: Certain electronic databases such as PubMed, Embase, Scopus, and PEDro were used to look for English-language publications that appeared from 2000 to the day of searching, i.e. 19 July 2013. Experimental studies with or without randomisation were reviewed, which presented the application of any form of choreotherapy in older adults and compared it to a different intervention, or a lack thereof, and were based on the results of reliable means of measuring physical and/or mental states of the patients. The choreotherapy in these studies could constitute the only form of interaction, or could be a part of a therapeutic intervention.
Results: Among the 261 works that were found, 18 met the inclusion criteria for the analysis. In the 10 randomized studies, one had a low methodological quality, six had a moderate reliability, and three had a high methodological quality. In the eight non-randomized studies, there were two studies of a "before-and-after" type with a control group. There were also six studies of the same type, but these were not controlled. The applied choreotherapy methods were: Korean dance movement, Tango, Waltz/Foxtrot, ballroom dancing, Salsa, modern jazz, improvisational dance, the Lebed Method (a form of dance therapy), Wu Tao dance therapy, and Dance Movement Therapy.
Conclusion: Dancing seems to be an effective form of exercise for older adults, as it improves the variables related to the performance of the motor system and the mental wellbeing of the participants. However, it is necessary to carry out well-planned studies that will indicate the optimal types and parameters of dance that can be used to improve specific motor disorders in older adults.

**Słowa kluczowe**
choreoterapia, taniec, terapia tańcem, osoby w podeszłym wieku

**Streszczenie**
Wstęp: Choreoterapia wykorzystuje ruch i taniec do wyrażania uczuć, emocji i doświadczeń, pozwala na trening równowagi, koordynacji ruchu, jego płynności i czasowej synchronizacji. Biorąc pod uwagę różnego rodzaju zaburzenia typowe dla wieku starczego, dobroczynne walory choreoterapii wydają się idealnie pokrywać z wymaganiami, które stawia się kompleksowej rehabilitacji osób starszych.
Cel: Przegląd literatury poświęconej zastosowaniu choreoterapii w populacji osób starszych, niezbędny do sformułowania rekomendacji do zastosowania tej metody lub stwierdzenia jej braku.

The individual division on this paper was as follows: a – research work project; B – data collection; C – statistical analysis; D – data interpretation; E – manuscript compilation; F – publication search

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**Metody:** Przeszukano elektroniczne bazy danych: PubMed, Embase, Scopus, PEDro, poszukując publikacji w języku angielskim, które ukazały się od 2000 roku do dnia przeszukiwania baz danych, czyli 19 lipca 2013. Badania eksperymentalne z randomizacją lub bez, włączone do przeglądu, powinny były przedstawiać zastosowanie dowolnej formy choreoterapii u osób starszych, porównując ją do innej interwencji lub jej braku w oparciu o wyniki wiarygodnych narzędzi pomiarowych mierzących stan fizyczny i/lub psychiczny badanych. Choreoterapia mogła być jedyną formą oddziaływania lub stanowić część postępowania terapeutycznego.
**Wyniki:** Spośród 261 odnalezionych prac 18 spełniło kryteria włączenia do analizy. Pośród 10 badań randomizowanych znalazło się jedno o niskiej jakości metodologicznej, 6 odznaczało się umiarkowaną rzetelnością, a 3 wysoką jakością metodologiczną. Wśród 8 badań nierandomizowanych znalazły się 2 badania typu „przed-po" z grupą kontrolną oraz 6 badań tego samego rodzaju, lecz niekontrolowanych. Zastosowane metody choreoterapii to: Korean dance movement, tango, waltz/foxtrot, ballroom dance, salsa, modern jazz, improwizacje taneczne, metoda Lebed Method – forma tańca terapeutycznego, terapia tańcem Wu Tao oraz terapia ruchowa tańcem (Dance Movement Therapy).
**Wnioski:** Taniec wydaje się być efektywną formą zajęć ruchowych dla osób starszych, wpływając na poprawę zmiennych związanych z działaniem aparatu ruchu i samopoczuciem psychicznym. Konieczne jest przeprowadzenie dobrze zaprojektowanych badań, które pozwolą na wskazanie optymalnego typu i parametrów tańca wykorzystywanego w celu poprawy ściśle określonych zaburzeń ruchowych osób starszych.

## INTRODUCTION

Both anatomical and physiological changes occur with age. Ageing involves a progressive loss of functional abilities, as well as disorders in the functioning of individual organs and systems[1]. Changes in the muscular system, whose fitness directly translates into the ability to function independently, are felt in a particularly acute manner[2]. Changes also occur in the somatosensory system, the visual system and the vestibular system. The faulty functioning of these systems contributes to the lack of appropriate sensory stimulation, which is necessary for the correct functioning of the nervous system, both in its afferent and efferent parts. Consequently, this leads to disturbances in postural control[3]. The conducted research showed that the movement of the body's centre of gravity in older people is significantly greater, which emphasises the remarkably poorer balance and higher risk of falling in this age group[4]. Apart from changes in the musculoskeletal system, other types of disorders typical for old age are behavioural and cognitive disorders. a significant intensification of these disorders also excludes older persons from social life and makes them dependent on caretakers.

Non-pharmacological forms of treatment which have been used successfully with older people include neuropsychology, occupational therapy, and alternative methods that include music therapy[5]. An active variant of music therapy is choreotherapy (i.e. a psychotherapy method), in which movement and dance are used to express feelings, emotions and experiences, both positive ones and negative ones[6]. The advantages of dancing have been quickly appreciated, and this has been found to be an effective therapeutic tool allowing for the training of balance, movement coordination, and the fluency and synchronisation of movement[7].

The benefits of choreotherapy seem to ideally meet the requirements for the comprehensive rehabilitation of older people, which take the above-mentioned possible pathologies of this period of life into account. The above arguments provided the authors with an incentive for conducting a review of the literature on the use of choreotherapy in populations of older people, in order to give reliable recommendations for using this method or for rejecting it, on the basis of the principles of medicine and based on scientific proof.

## METHODS

The study involved browsing the PubMed, Embase, Scopus and PEDro databases, in order to look for publications in English that have appeared between the year 2000 and the day of the search, i.e. 19 July 2013. The following keywords were entered into the search engine: dance therapy and choreotherapy. The thesauruses proposed in the browsed databases, including MeSH and Emtree, were also used.

### Inclusion criteria

#### Population

The main criterion for including articles in the analysis was the age of the studied persons undergoing choreotherapy. Studies concerning persons over 60 years of age, regardless of their base illness, were analysed (Figure 1).

#### Intervention

For the purpose of the study, any method of dance therapy or physical exercises performed to music was included. Furthermore, the choreotherapy could constitute the only form of treatment, or could be a part of a comprehensive rehabilitation programme. The necessary frequency and duration of the technique were not defined. Also, the dance therapy could be compared to other types of physical therapy, or to another method of therapeutic intervention that was not related to physical activity. a lack of intervention was assumed to be the acceptable form for a control group.

#### Studied variables

The publications included in the review had to contain an analysis of the effects of choreotherapy on at least one of the following variables: physical fitness (expressed as a result of a standardised test); mental state; quality of life; and cognitive functions. These variables were investigated with reliable and objective neuropsychological tests.

#### Type of studies

The analysis encompassed both experimental randomised research with a control group and non-randomised experimental research.

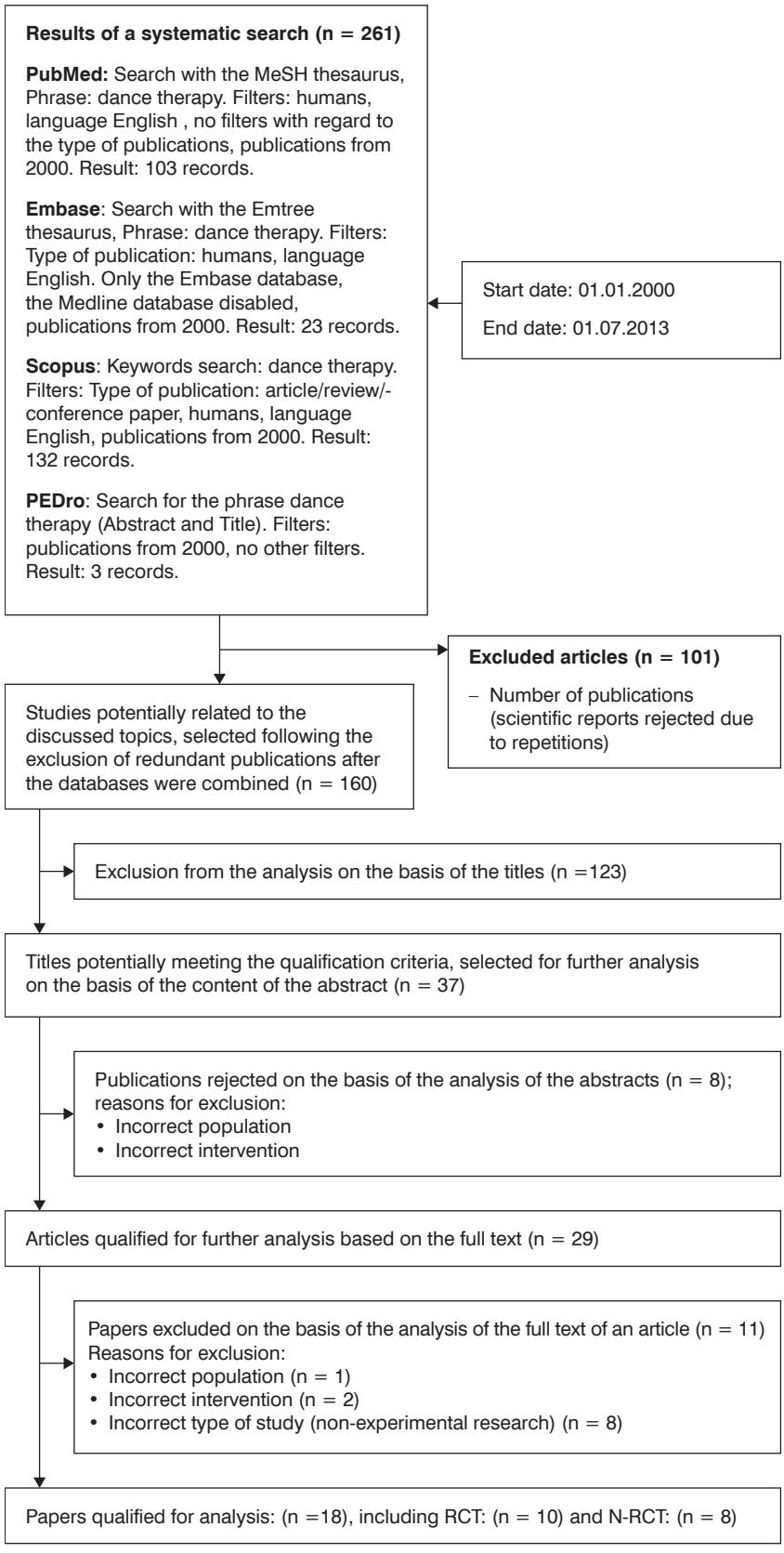


**Figure 1**

**Process of searching for the publications meeting the qualification criteria**

### Selection

Two researchers individually verified and evaluated the obtained records, after browsing for publications that met the above-mentioned inclusion criteria. Along with a decision for exclusion at each stage of the verification process, the indicated procedure was carried out on the basis of the PRISMA guidelines (*Preferred reporting items for systematic reviews and meta-analyses*)[8]. Any difference in the obtained result was discussed and a consensus was reached. Titles, abstracts and full publications, in this order, were first viewed to identify those that met the assumed criteria. Next, the reliability of the included articles were evaluated, using the PEDro scale in the case of randomised studies (RCT)[9]. The PEDro scale evaluates 11 elements of experimental studies, including: selection criteria; random distribution into groups and confidentiality of this distribution; blindness of the researchers, testers and participants; number of participants who completed a study; and the presentation manner of the results. The studies that obtained a score of 0–3/10 points were considered to have a low methodological quality, while those with a score of 4–5/10 points were considered to be of a moderate methodological quality and those with a score of over 6/10 points were considered to have a high methodological quality[10].

## RESULTS

The process of the qualification of articles for the final analysis is presented in Figure 1.

In the end, 10 randomised and 8 non-randomised studies were included in the review. Of these, the non-randomised studies comprised two 'before-and-after' studies with a control group[11,12], and six 'before-and-after' studies without a control group[13-18]. The ten randomised studies included one of a low methodological quality[21], which was caused primarily by the lack of blindness of the study participants, and an unclear manner of their random division into groups, and consequently, there was a lack of initial homogeneity in the groups and an insufficient number of participants who completed the programme according to the planned treatment. Among the remaining randomised studies, six were characterised by a moderate reliability and three had a high methodological quality (Table 3).

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**Table 1**

**Description of the appraised studies – Non-randomised studies**

| Reference | Type | Choreotherapy | Subjects | Experimental intervention/Music therapy (duration, method) | Control intervention | Outcome measurements | Result |
|---|---|---|---|---|---|---|---|
| Selman L. et al. 201211 | Controlled before-and--after study | Dance therapy [The Lebed Method (TLM)] | 18 hospice patients participated (mean age 63.8 years; 16 female; 14 with cancer diagnoses) with 10 performing yoga, 5 performing TLM, and three both yoga and TLM. 14 of the participants completed more than one assessed course. | Dance therapy [The Lebed Method (TLM)]. | Yoga classes | Measure Yourself Concerns and Wellbeing Questionnaires | The patients' most prevalent concerns were: mobility/fitness (n = 20); breathing problems (n = 20); arm, shoulder and neck problems (n = 18); difficulty relaxing (n = 8); back/postural problems (n = 8); and fear/anxiety (n = 5). Factors affecting the patients' health other than the therapy were prevalent and were predominantly negative (e.g. treatment side effects). The patients reported psycho-spiritual, physical and social benefits. Their concern scores improved significantly (P <0.001) for both therapies; while the improved well-being was clinically significant for yoga. |
| Song R. et al. 200412 | Controlled before-and--after study | Korean dance movements (aerobic exercises with a target heart rate of 50% of the maximum heart rate) | 73 older adults living in residential homes (with a mean age of 75 years; SD = 6.9; a range of 54-90 years; and 87% women). | 46 participants exercised using traditional Korean dance movements for 50 min, 4 times per week, for 6 months. After 10 weeks of supervised exercise sessions, the participants were encouraged to perform the dance movements independently, led by one of the participants to allow for unsupervised participation. | 27 dropout patients at the end of the 6-month programme | Behaviour; Sickness Impact Profile (SIP) and a Health Behaviour Scale were collected at the beginning of the intervention; and then at 10 weeks and 6 months into the programme the Motivation Scale for Health was used. | The difference in motivation was significant between the participants and the dropouts over time, especially as the participants gradually perceived more benefits than the dropouts. The programme participants showed more self-efficacy and more perceived benefits, while the motivational level of the dropouts either decreased or remained the same. Both groups reported that they performed more health behaviours over time, but the positive changes in the performance of the health behaviours for the programme participants were significantly greater than those for the dropouts. Also, the participants showed significant improvements in most dimensions of their functional status when compared to the dropouts. |
| Hackney M.E. et al. 201313 | Uncontrolled before-and-after study | Adapted Tango programme | 13 older adults with visual impairments (7 women; mean age = 86.9 years; SD = 5.9 years, with a range = 77-95 years). | An adapted Tango programme of twenty 1.5-hour lessons, within an 11 week period. | Lacking | The programme was evaluated for feasibility and participant satisfaction (by an Exit Questionnaire). Participants were tested for: balance, lower body strength (the Dynamic Gait Index (DGI)), and quality of life (The National Eye Institute Visual Function Questionnaire-25 (VFQ-25)) after the programme and 1 month later. | The facility was adequate, no injuries were sustained, and the participants and volunteers were retained throughout. The participants reported enjoyment and improvements in their physical well--being. Exploratory measures of their dynamic postural control, lower body strength, and general vision-related quality of life scores showed improvements following the training. |

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| Kim C.G. et al. 200314 | Uncontrolled before-and-after study | Korean dance movement (KTDM) | Sample of 21 elderly women recruited from a home for elderly people located in Chunchon, Korea. | Four sessions of KTDM exercise were performed every week, and six education classes on various health subjects and individualised counselling sessions were continued for 3 months. | Lacking | Cardiovascular Risk Factors Profile; and Health Behaviour Scale; The life satisfaction scale was measured at the beginning and at end of the programme, and at 3 months after the programme. | The mean total risk factor was 20.1 at the pre-test, indicating that the subjects were at a low-to-moderate level of risk for cardiovascular disease. This score significantly decreased to 16.8 (SD = 3.2) at the end of the programme, but increased again to 18.1 (SD = 4.0) 3 months after the programme ended. The performance of the health behaviours significantly increased during the health-promotion programme. The mean total health behaviour score was 66.3 at the pre-test, and increased to 69.7 at the end of the programme, but then this also slightly decreased to 68.1 at 3 months after the programme ended. The mean score of the life satisfaction for the subjects significantly increased during the programme period. |
| Marchant D. 201015 | Uncontrolled before-and-after study | Contact improvisation classes | 11 participants recruited from the Washington University School of Medicine's Movement Disorders Centre and from the St. Louis area. The participants had been previously diagnosed with idiopathic PD according to the established criteria. | The participants were instructed during 10 1.5-h contact improvisation dance classes, over a period of 2 weeks, with healthy volunteers as the dance partners for the study participants | Lacking | The Unified Parkinson's Disease Rating Scale-Motor Subscale III (UPDRS); the Berg Balance Scale (BBS); the Timed Up and Go test (TUG); the Five Times Sit-to-Stand Test (5× STS), and the Six Minute Walk Test (6MWT) were used. Three forms of gait were assessed using a computerised GAIT Rite walkway. | Participants demonstrated improvements in their Unified Parkinson Disease Rating Scale-Motor Subsection and Berg Balance scores, along with increased swinging and decreased stance percentages during walking. Their backward step length also increased. The participants expressed a high level of enjoyment and interest in taking future CI classes. |
| Alpert P.T. et al., 200916 | Uncontrolled before-and-after study | Modern jazz dance classes | 15 healthy, community-dwelling women aged 52 to 88 years (mean age = 68; SD = 8.6 years), were recruited from the pool of individuals already enrolled in a senior dance class. | 15 weeks of modern jazz dance classes, consisting of modified, choreographed traditional ballet movements, which required some flexibility, balance, and cognitive skills, particularly short- and long--term memory. | Lacking | Measurements were taken for the mental status (The Mini Mental Status Examination ((MMSE)); depression level (Geriatric Depression Scale (GDS)); and balance (the Sensory Organisation Test (SOT)). These were performed at the baseline (t 1-2 week), the mid--semester (8 weeks), and the end of the study (15 weeks). | The differences in mean MMSE and GDS scores over time were not significant; however, the SOT scores showed an increasing trend ($p < .001$). An analysis of variance of the data with repeated measurements shows that the balance measures improved throughout the duration of the study ($F2,10 = 19.68$, $p < 0.001$). Post hoc analyses using paired t tests with a Bonferroni correction indicate that a significant increase in balance occurred from time 1 to time 2, and again from time 2 to time 3. |



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| Krampe J. et al., 201021 | Uncontrolled before-and-after study | Therapeutic dance | 11 study participants, including 7 women and 4 men, were recruited from the Alexian Brothers Community Services PACE, in St Louis, Missouri. | The Lebed Method (TLM) – a specific type of therapeutic dance – was combined with low-impact dance and with upbeat participant-specific music. The programme emphasised balance and mobility, and was performed for 45 minutes, 3 times each week for 6 weeks. | Lacking | A Functional Reach (FR) test for balance and the Timed Get Up and Go (TGUG) for gait were measured 3 times: at the baseline; 6 weeks after the start of the intervention; and 6 weeks post-intervention. | A comparison of the pre- and post-FR and the TGUG indicates positive trends in the functional status of the participants. An improvement in their FR from the baseline to the end of the intervention was noted in the majority of the participants. |
| Duignan D. et al., 200918 | Uncontrolled before-and-after study | Wu Tao dance therapy; | 5 women and 1 man participated, who were residents from a low-care facility, aged between 81 and 92 years, with a mean age of 85.1. All of the participants had a diagnosis of dementia. | Wu Tao combines gentle movement, music and meditation, which have been designed to harmonise the flow of energy, and are suitable for people from all walks of life and ages. It has its origins in oriental medicine. | Lacking | Cohen-Mansfield Agitation Inventory (CMAI). | A post CMAI measurement was taken following the final Wu Tao session to identify any changes in the participants. The result showed the average score was 60.67, meaning there was an average reduction in the agitation scores of 6.16. It is therefore possible that this therapy can reduce agitation and bring life and fun to both residents and staff in residential facilities. |

**Table 2**

**Description of the appraised studies – Randomised controlled trials**

| Author | Type | Subjects | Outcome measurements | Choreotherapy | Results | PEDro |
|---|---|---|---|---|---|---|
| Crane-Okada R. et al. 201219 | RCT | 49 female breast cancer survivors (BCSs) aged from 50 to 90 years (with an average of 65.6 years) who were 50 years or older and at 12 months or more following treatment, and were at an average of 9.8 years since their diagnosis (ranging from 1-32 years). | The QOL (Quality of Life for Breast Cancer) questionnaire measured 4 domains of well-being at the baseline, and after 12 and 18 weeks. The EG participants also kept home practice diaries. Other measurements of mindfulness were obtained (the Mindful Attention Awareness Scale; the Self-compassion Scale; the Five Facet Mindfulness Questionnaire; and the Experiences Questionnaire). | The 12-week Mindful Movement Programme (MMP) intervention combined mindfulness with self-directed movement. Using verbal cues from the leader, often with music, the participants were encouraged to move their bodies in ways that were comfortable, fun, creative, and interesting to them. | After the intervention, the EG participants showed improved QOL with decreased fear of recurrence and an increased mindfulness attitude. At 6 weeks, the initial effects were retained. The MMP appears to benefit older BCSs by reducing their fear of cancer recurrence and by improving their mindfulness attitude. | 4/10 |

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| Hokkanen L. et al. 200820 | RCT | 29 residents (76% female) of a dementia care nursing home participated. 14 had Alzheimer's disease, 8 had vascular dementia, and 7 had undefined types of dementia. Patients were randomised into an intervention group (n = 19, with a mean age 79.9 ± 7.7) and a control group (n = 10, with a mean age 84.5 ± 3.4). | Assessments were performed 1 week before and immediately before the DMT, at weeks 5, 9 and 13 (with a follow-up at 4 weeks post-intervention) and included the Mini-Mental State Examination (MMSE); the Word List Savings Score and the Clock Drawing Test; the Cookie Theft picture description task from the Boston Diagnostic Aphasia Test; and the Nurses' Observation Scale for Geriatric Patients (NOSGER). | The DMT (Dance Movement Therapy) intervention consisted of nine sessions during 1-week intervals lasting for 30 to 45 minutes each. The control group spent the same amount of time engaged in regular nursing home activities. | The MMSE score improved slightly in the DMT group, but not in the control group. The DMT intervention group improved in the task of visuospatial ability and planning (assessed with the Clock Drawing Test), whereas the control group remained unchanged or deteriorated mildly. In terms of memory (Word List delayed recall) no effect was found. Thus, DMT may stimulate visual functions and planning more than memory, but the findings are inconclusive. Another benefit was previously observed in the information content of speech output, and this was partly replicated. The behavioural symptoms remained relatively stable, but the participants' self-care ability and IADLs seemed to improve slightly. There was no difference between the groups on the Word List Savings Score. However, the Picture Description Task improved from the baseline to the follow-up in the DMT group (14.32 ± 13.62 and 19.76 ± 8.02, respectively; t = _2.184; and p =.044) but not in the control group (13.75 ± 12.68 and 13.4 ±10.15, respectively).<br>The groups did not differ according to their total NOSGER score. | 4/10 |
| Krampe J. et al. 201021 | RCT | 27 participants (17 females) from a single Midwest aging-in-place (AIP) facility, with a Mini-Mental State Exam (MMSE) score of 23 or above and ability to stand up with or without assistance for short periods of time. Their ages ranged from 63 to 96 years, with a mean of 85 ±7.5. The treatment group numbered 15 (73% females), and the control group numbered 12 (50% female). | Balance measurements: The MDRT allowed for the analysis of a person's voluntary postural control. Mobility measurements: The GAITRite System electronic walkway was used to measure the temporal (timing) and spatial (two dimension geometric position) parameters of the participants' mobility patterns through their velocity, SLD, and a FAP score. | The sessions included 10 min of lymphatic warm-up movements, 30 min of dance-based therapy, and 5 min of cooling down. The dance therapy included low-impact aerobics and stretching mixed with dance movements. The dance movements, based on simple jazz and ballets steps comprised of shifting weight, reaching arms in every direction, lifting legs, and flexing feet. 18 dance sessions were held, 3 times each week for 6 weeks. Each session lasted 45 min. | The post-measurements for balance in the treatment group improved significantly when compared with the control group. However, the data did not show that the post-measurements for mobility in the treatment group improved significantly when compared with the control group – although the secondary ES analysis did show an effect on all components of the mobility patterns. It should also be noted that even though the control group measurements were higher on each component of mobility, an effect for the intervention group was noted for the participants with a high attendance. | 3/10 |



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| Hackney M.E., Earhart G.M. 201022 | RCT | 39 participants with PD, without a history of other neurological deficits, at least 40 years of age, who could stand for at least 30 minutes, and could walk independently for three or more metres with or without an assistive device. All of the participants had a diagnosis of idiopathic PD (Hoehn and Yahr (H&Y) at stages of I-III). | Balance measurements: The Berg Balance Scale (BBS) Gait was measured for comfortable walking and fast-as-possible walking velocity and cadence; tandem stance (TS), and one legged stance (OLS). The Timed Up and Go test (TUG) and the Six Minute Walk Test (6MWT) were evaluated in the weeks immediately before, immediately after, and 1 month after the intervention. | Partnered or non-partnered Tango classes were attended for 1 hour twice per week, so that 20 lessons were completed within 10 weeks. The non-partners learned the same Argentine "leading" and "following" Tango-based steps as in the partner groups, but performed them without a partner. | Both groups had improvements in the BBS for comfortable walking velocity, and their fast-as-possible walking velocity at the post-testing. Both groups also improved significantly in their one legged stance time, their tandem stance time, and their cadence and double support percent at the post-testing. Except for the one legged stance time, all of the improvements that were significant at the post-testing were maintained at the follow-up. The 6MWT ($p = 0.028$, where the critical level is $p = 0.025$) and the fast-as-possible walking swing percent ($p = 0.041$, where the critical level of $p = 0.025$) were close to significance at post-testing, and also attained significance at the follow-up. The comfortable and fast-as-possible stride length demonstrated a nearly significant main effect of time ($p = 0.051$). Those in the non-partner group had longer stride lengths than those in the partner group. | 5/10 |
| Hackney M.E., Earhart G.M. 200923 | | 58 participants with idiopathic PD Hoehn and Yahr (H&Y) at stages of I-III took part in the intervention. They were least 40 years of age, could stand for at least 30 minutes, and could walk independently for 3 or more metres with or without an assistive device. | Measurements included the: Unified Parkinson's Disease Rating Scale Motor Subscale 3 (UPDRS); Berg Balance Scale (BBS); the Timed Up and Go test (TUG); the Six Minute Walk Test (6MWT); the Freezing of Gait (FOG) questionnaire; and the forward and backward gait-GAITRite walkway (CIR Systems, Inc., Havertown, PA) to measure gait velocity, stride length, and single support time. | Those in the dance groups attended 1-hour classes 2 times per week, completing 20 lessons within thirteen weeks. The dance classes consisted of progressive Tango lessons or Waltz/Foxtrot lessons, and were taught by the same instructor who was an experienced professional ballroom dance instructor and an American Council on Exercise certified personal trainer. | Over the course of the intervention, both the Tango and Waltz/Foxtrot groups exceeded the gains of the control group, which improved in no measures. Significant improvements were noted in the Tango and Waltz/Foxtrot groups in the BBS, the 6MWT and the backward stride length when compared to the control group. Other non-significant improvements were noted in Tango group in the TUG, and in both dance groups for other aspects of gait. The control group worsened significantly with respect to the disease severity, as measured by the UPDRS, and on their time spent with a single support during forward and backward walking. | 5/10 |
| Hackney M.E. et al. 200724 | RCT | 19 subjects diagnosed with idiopathic PD recruited from the Washington University School of Medicine's Movement Disorders Centre and from the surrounding St. Louis community. PD diagnostic criteria outlined by Racette et al. | Unified Parkinson's Disease Rating Scale (UPDRS)- Motor Subscale 3; Freezing of Gait; Gait velocity with and without a concurrent dual task; Berg Balance Scale; Timed Up and Go test | Those in the Tango group participated in progressive Tango dance lessons; two one-hour sessions per week; 20 sessions within 13 weeks. All training sessions were led by an instructor who is both a professional ballroom dancer and American Council on Exercise (ACE)-certified personal trainer. The control group took part in 20, one-hour exercise classes which consists of breathing, stretching exercises, resistance and dexterity exercises. | Both groups showed significant improvements in overall UPDRS –motor subscale score. Within groups, there was no significant change in perception of freezing for either the Tango or the exercise group. Only the Tango group showed significant improvements on the Berg Balance Scale. The Tango group showed a trend toward improvement on the Timed Up and Go test that was not observed in the exercise group. Both groups showed slight, nonsignificant changes in gait velocity. | 6/10 |

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| Hackney M.E., Earhart G.M. 200925 | RCT | 75 Parkinson patients at least 40 years of age took part in the study. They could stand for at least 30 minutes, and walk independently for three or more metres with or without an assistive device. The PD was determined to be at Hoehn and Yahr stages of I-III. | Measurements included the: Unified Parkinson's Disease Rating Scale Motor Subscale 3 (UPDRS--III); walking with subtraction tasks; and the Parkinson Disease Questionnaire-39 items (PDQ-39) for the measurement of the participants' subjective health. | The programme consisted of 20 twice weekly 1 hour sessions of either Argentine Tango (Tango), or combined Waltz and Foxtrot lessons (Waltz/Foxtrot: 30 min Waltz, 30 min Foxtrot), or Tai Chi. All of the steps were done in a "closed practice" position, which is an adaptation of the traditional ballroom frame. Some participants were also chosen to be part of a No Intervention group. | The Tango group showed significantly decreased scores in mobility ($p = 0.03$), social support ($p = 0.05$) and PDQ-39 SI ($p < 0.01$) indicating an improved HRQoL. There were no significant differences in the HRQoL between the pre- and post-programme in the Waltz/Foxtrot, Tai Chi or No Intervention groups. Thus, Tango may be helpful for improving HRQoL in PD because it addresses balance and gait deficits in the context of a social interaction that requires working closely with a partner. We compared the measurements of the PDQ-39 from those classified in the Longer and Shorter Duration groups, with all the participants collapsed across the three intervention groups. The main effects of the group were found for mobility ($F(1,42) = 4.10$, $p = 0.05$), and PDQ-39 SI ($F(1,42) = 4.44$, $p = 0.04$), with the Shorter Duration group having lower (better) improvement scores than the Longer Duration group for these domains. | 4/10 |
| Borges E.G.D.S. et al. 201226 | RCT | 75 sedentary elderly subjects from long-term institutions. | The protocol of the Latin American Group for Maturity (GDLAM) was used to evaluate functional autonomy. Also, physical balance was analysed using a stabilometer and posture metre platforms. | The Ballroom Dance Programme lasted for 50 min and took place three times a week. There were various rhythms, such as the Foxtrot, the Waltz, the Rumba, Swing, Samba and Bolero. The basic structure of the class was the same for all of the participants; however, each dancer displayed a different level of development (progression), depending on his or her physical ability, energy level, level of motivation and cognitive ability. All of the classes were preceded by a warm-up and stretching period, and ended with a cool-down. | Only the members of the EG achieved a significant reduction in weight ($\Delta = -0.98$ kg) following the experiment, both in the intragroup ($p = 0.002$) and in the intergroup analysis ($p = 0.012$). In the evaluation of functional autonomy, only the EG showed a significant reduction in the execution time of all the tests and in the GDLAM index: GI ($\Delta = -6.99$), both in the intragroup ($p < 0.001$) and in the intergroup analysis ($p = 0.011$). | 5/10 |
| Granacher U. et al. 201227 | RCT | Twenty-eight community--dwelling older adults between the ages of 63 and 82 | Evaluations included: the 'Freiburg Questionnaire for everyday and sports activities'; the Mini-Mental State Examination, (MMSE ); the Clock-Drawing Test (CDT ) to evaluate executive functions; as well as measurements of static and dynamic postural control on a balance platform and a pressure-sensitive walkway. | Participants in the INT group took part in a 60-minute Salsa dance programme over a period of 8 weeks (twice weekly). Salsa is a partnered dance that is characterised by Latin American rhythm and music. The dance programme consisted of basic steps (e.g. 3-step weight changes) and the simplest movements of Salsa in forward, backward, transversal and rotational directions. | A tendency towards an improvement in the selected measures of static postural control was observed in the INT group, when compared to the CON group. Significant group test interactions were also found for stride velocity, length and time. Post hoc analyses revealed significant increases in the stride velocity and length, and a concomitant decrease in the stride time. However, the Salsa dancing did not have a significant effect on the various measurements of gait variability and leg extensor power. | 6/10 |



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| Duncan R.P., Earhart G.M. 201228 | RCT | 62 individuals with clinically defined "definite PD" (Hoehn and Yahr stages I-IV) from the Washington University Movement Disorders Centre, aged 69.3 ±1.9 (ranging from 48-89) took part in the Tango group. | Participants were assessed off anti-Parkinson medication at the baseline, and at 3, 6 and 12 months. The primary outcome measurement was the Movement Disorders Society-Unified Parkinson Disease Rating Scale 3 (MDS-UPDRS-3). Secondary outcome measurements were also obtained using the MDS-UPDRS-1, MDS-UPDRS-2, Mini BESTest balance test; the Freezing of Gait Questionnaire (FOG_Q); the 6-Minute Walk Test (6MWT); gait velocity for comfortable forward walking, fast-as-possible forward walking, dual task, and backward walking; and the Nine--Hole Peg Test (9HPT). | Tango participants attended 1-hour community based Argentine Tango classes twice weekly for 12 months. The participants danced in both leader and follower roles, changed partners frequently, and learned new steps and/or integrated previously learned steps in new ways at each class. The control group took part in no intervention. | The Tango group improved whereas the control group showed little change on most measurements. For the MDS-UPDRS-3, there was no significant change in the control group from the baseline to 12 months; whereas the Tango group had a reduction of 28.7% (12.8 points). There were also significant group by time interactions in favour of the dance group for MDS-UPDRS-3, Mini BESTest, FOG_Q, 6MWT, forward and dual task walking velocities, and the 9HPT. | 6/10 |

**Table 3**

**Methodological quality (PEDro scores) of the studies included in the review**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Study** | **Eligibility criteria** | **Random allocation** | **Concealed allocation** | **Baseline comparability** | **Blind subjects** | **Blind therapists** | **Blind assessors** | **Adequate follow-up** | **Intention-to-treat analysis** | **Between--group comparisons** | **Point estimate and variability reported** | **Total (0-10)** |
| Crane-Okada R. et al., 201219 | Y | Y | N | N | N | N | N | N | Y | Y | Y | 4/10 |
| Hokkanen Let al., 200320 | Y | Y | N | Y | N | N | N | N | N | Y | Y | 4/10 |
| Krampe J. et al., 201317 | Y | Y | N | N | N | N | N | N | N | Y | Y | 3/10 |
| Hackney M.E., Earhart G.M., 201022 | Y | Y | N | Y | Y | N | N | N | N | Y | Y | 5/10 |
| Hackney M.E., Earhart G.M., 200923 | Y | Y | N | Y | N | N | Y | N | N | Y | Y | 5/10 |
| Hackney M.E. et al., 200724 | Y | Y | N | Y | N | N | Y | Y | N | Y | Y | 6/10 |
| Hackney M.E., Earhart G.M., 200925 | Y | Y | N | Y | N | N | N | N | N | Y | Y | 4/10 |
| Borges E.G.D.S. et al., 201226 | Y | Y | N | Y | N | N | N | Y | N | Y | Y | 5/10 |
| Granacher U. et al., 201227 | Y | Y | N | Y | N | N | N | Y | Y | Y | Y | 6/10 |
| Duncan R.P., Earhart G.M., 201228 | Y | Y | N | Y | N | Y | N | N | Y | Y | Y | 6/10 |

Y – Yes; N - No

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In the analysed publications, the choreotherapy methods used were: Korean dance movement[12,14], Tango[13,22-25,28], Waltz/Foxtrot[23,25], ballroom dancing[26], Salsa[27], modern jazz[16,21], dance improvisation[15,19], the Lebed Method (a form of dance therapy) [11,17], Wu Tao dance therapy[18] and Dance Movement Therapy[20]. The above-mentioned methods involved both single dancing[12,16-19,21] and dancing in pairs[13,15,22-28]. The shortest programme lasted for two weeks[15] and the longest one took place for half a year[12]. Mostly one-hour dancing classes were conducted, comprising a warm-up, the main part and a finishing section[12,21-23,25-28]. The majority of the programmes involved at least bi-weekly meetings[12-15,17,21-23,25-28]. The dancing classes, although varying in their form, were aimed at improving general health[11,12,14,20,26,27], well-being[11,18,19], balance[13,15-17,21,22,24,27,28], muscle strength[13], gait[13,15,17,21-25,28], quality of life[13,19] and cognitive abilities[16,19,20,27], reducing the risk factors of circulatory disorders[14] and depression[16], and improving the functioning of persons with symptoms characteristic of particular illnesses (first and foremost, the symptoms of Parkinson's disease measured with the Unified Parkinson's Disease Rating Scale)[15,23-25,28].

Apart from the persons with Parkinson's disease[15,22-25,28], the choreotherapy was also used to treat a range of older persons, including women with breast cancer[19], dementia patients in the care of nursing homes[20], hospice patients[11], persons living in old people's homes[12,14,16-18,21] and older persons with visual impairments[13].

A detailed description of the studies that qualified for the review, including the description of a sample, the research tools, the choreotherapy methods and the results of the intervention are presented in table 1 and table 2.

## DISCUSSION

Despite the fact that dancing is a popular form of activity with seniors, there are relatively few studies (and in particular, long-term observations) concerning the beneficial effects of dancing on the physical and the mental state of older persons. In the literature, publications and reviews dedicated to the use of dance therapy in persons with Parkinson's disease are dominant[7,29]. The results of a meta-analysis conducted in 2012 indicated a positive effect of dancing exercises and movements to the rhythm of music on balance tests, gait tests and step length in this group of patients. However, the authors indicated the need for further long-term observations aimed at confirming the neuroprotective effect of dance therapy and evaluating the possibility for the regular attendance of older persons in choreotherapy[30]. The results of a systematic review from 2015 also presented certain guidelines concerning the frequency and intensity of the conducted dance classes for patients suffering from Parkinson's disease. The authors suggested that the most beneficial arrangement involved exercising two times a week for an hour, for a period lasting at least 10 weeks[29]. Studies on the types of dance therapy in this group of patients also allowed the authors to choose the most beneficial programme for the dancing classes. In this case, the Tango proved to be the dance that brought the most benefits with regard to movement disorders in patients with Parkinson's disease[23].

Unfortunately, similar studies have not been conducted for other populations of older people, and attempting any such conclusions on the basis of own review would present many challenges. This is due to the diversity of the described populations of older persons, their base diseases and comorbidities, the multitude of the dance forms used in the therapy, the different tools for evaluating the effects of these dancing forms, and the variables subjected to observation before and after the intervention. Individual reports confirm that both dancing and strength training are activities that are usually accepted by populations of older people, and most importantly, these activities tend to improve the seniors' mood[31]. Furthermore, R sler described a positive effect of Waltz classes on the learning ability of patients with Alzheimer's disease[32]; and a team of British researchers argued that dance therapy is a good form of complementary therapy in palliative care[11].

The publications that qualified for this review also confirmed a beneficial effect of dance therapy on various areas of life in older persons, from physical aspects, through to the mental sphere and social relations[11-28]. This is consistent with the opinions of other authors, who have undertaken attempts to evaluate the effects of dance therapy in a population of older people[33]. All of the authors emphasised that dancing is a physical activity that is easily available and makes the participants more socially active. Music is also an external source of sensory information, that enforces movement at an appropriate pace; and steps backwards, twirls and carioca steps are all very good physical training techniques for older people[34]. However, the publications in this research have a few limitations. Dancing is very often compared to a lack of intervention, which does not allow for an analysis of whether the beneficial effect is simply a result of physical activity or is a specific benefit of dancing. Also, many of the studies included in the review qualified as low in the current assessment system of their result reliability, mostly because of their methodological quality.

## CONCLUSIONS

Dancing seems to be an easily available and effective form of physical exercise for older persons, which improves the variables connected with the functioning of the musculoskeletal system and mental well-being. It is necessary to conduct further well-designed studies that would allow researchers to determine the optimal type and parameters of dancing used to improve specific motor disorders in older persons. The personal, cultural and social preferences of the participants in the programmes should also be taken into account, in order to improve the chances of older adults participating in such programmes actively and with pleasure.

**Conflict of interest: none declare**

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